SOUTHWEST RESEARCH INSTITUTE®

6220 CULEBRA RD. 78238-5166 • P.O. DRAWER 28510 78228-0510 • SAN ANTONIO, TEXAS, USA • (210) 684-5111 • WWW.SWRI.ORG

CHEMISTRY AND CHEMICAL ENGINEERING DIVISION
FIRE TECHNOLOGY DEPARTMENT
WWW.FIRE.SWRI.ORG
FAX (210) 522-3377

FIRE PERFORMANCE EVALUATION TESTED IN ACCORDANCE WITH ASTM E 136-11, *STANDARD TEST METHOD FOR BEHAVIOR OF MATERIALS IN A VERTICAL TUBE FURNACE AT 750 °C*

MATERIAL ID: *873*
TRADE NAME: *5083 – H116*

FINAL REPORT
Consisting of 5 Pages

SwRI® Project No. 01.16052.01.620c
Test Dates: March 22 and 25, 2011
Report Date: April 14, 2011

Prepared for:

The Aluminum Association, Inc.
1525 Wilson Blvd., Suite 600
Arlington, VA 22209

Prepared by: Cory Harper, Technician

CH

Submitted by:

Christina Gomez
Research Engineer
Material Flammability Section

Approved by:

Matthew S. Blais, Ph.D.
Director
Fire Technology Department

1.0 INTRODUCTION

This report describes a small-scale fire test conducted on a material identified as *873* in accordance with ASTM E 136-11, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 °C*, for The Aluminum Association, Inc., located in Arlington, Virginia. Testing was conducted March 22 and 25, 2011, at the Fire Technology Department of Southwest Research Institute (SwRI), located in San Antonio, Texas.

This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

The results presented in this report apply specifically to the specimens tested, in the manner tested, and not to the entire production of these or similar materials, nor to the performance when used in combination with other materials.

2.0 DESCRIPTION OF TEST APPARATUS AND PROCEDURE

The ASTM E 136-11 hot-air ignition furnace consists primarily of an electrical heating unit and specimen holder. The furnace tube is a vertical tube, with an inside diameter of 100 ± 5 mm and a length of 230 ± 20 mm, made of ceramic that will withstand at least 750 °C. The inner ceramic tube, with an inside diameter of 75 ± 5 mm, a length of 230 ± 20 mm, and a thickness of approximately 3 mm, is placed inside the furnace tube and positioned 20 ± 2 mm above the furnace floor on spacer blocks. The test apparatus is shown in Figure 1.

The air temperature inside the furnace is stabilized to 750 °C prior to testing. Sheathed thermocouples are used to measure the temperature of the furnace air (T_f), specimen surface (T_s), and specimen interior (T_c). The duration of flaming is recorded during the test, and specimen mass loss is determined based on weight measurements before and after testing. ASTM E 136-11 requires that a series of four tests be conducted for each sample.

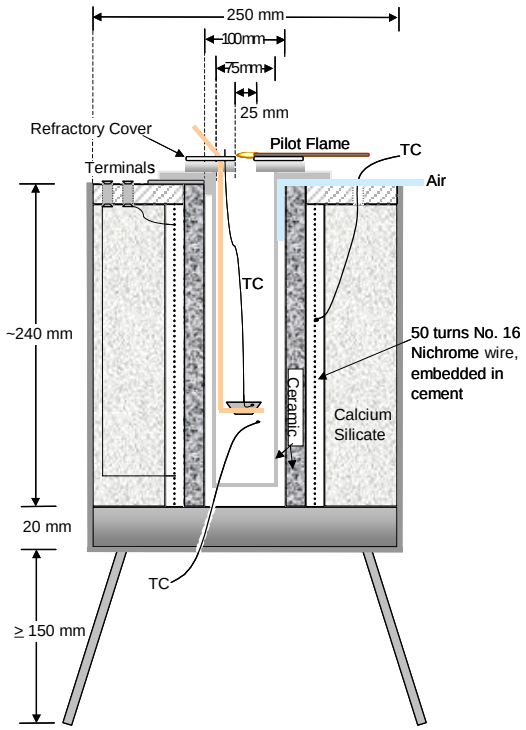


Figure 1. Schematic of SwRI's Hot-Air Furnace.

A material passes if at least three of the four specimens tested meet the following criteria (The three specimens do not need to meet the same condition.):

1. When the weight loss is 50% or less:
    a. The surface and interior thermocouples cannot have a temperature rise of more than 30 °C from the stabilized temperature measured by the interior thermocouple before testing.
    b. No sustained flaming after the first 30 s of the test.
2. When the weight loss is 50% or more:
    a. The surface and interior thermocouples cannot exhibit any temperature rise from the stabilized temperature measured by the interior thermocouple before testing.
    b. No flaming at any time during the test.

3.0 DESCRIPTION OF TEST SPECIMENS

The Aluminum Association, Inc., provided 48 specimens of the material, identified as *873*. The samples measured approximately 38 × 38 × 6.4 mm and were received by SwRI on February 28, 2011. A description of the material provided by the client can be found in Table 1. The samples were placed in a controlled environment maintained at 23 °C ± 2 °C (73 °F ± 5 °F) and 50% ± 5% relative humidity on March 5, 2011. Prior to testing, the specimens were placed in an oven at 60 °C for 24 hr, then placed in a desiccator to cool at room temperature. Eight specimens were stacked to obtain a nominal 50 mm thickness. Due to the nature of the material, at the 750° C heat

exposure from this test, the solid block changed phase to a liquid pool. To avoid furnace damage from molten material, the specimen edges were slightly trimmed and placed in an open-top vessel as described in section 6.2.1 of the ASTM E136-11 standard.

Table 1. Test Sample Description Provided by the Client.

Material ID	Description of Material	Composition	Nominal Thickness	Nominal Density	Color
873	5083 – H116 Aluminum Plate	Nominal w/o – 4.5Mg – 0.7 Mn – 0.15 Cr – Al Balance	0.25 in. (6.3 mm*)	0.096 lbs/in^3 (2690 kg/m^3*)	Aluminum (silver like) (Silver*)

* Measured by SwRI personnel.

4.0 TEST RESULTS

Testing was conducted on March 22 and 25, 2011. During testing, flaming was not observed in any of the four test runs. Tabular test data and graphs of the measured temperatures plotted with respect to time are presented on page 5.

5.0 CONCLUSIONS

The material identified as *873* **meets** the performance criteria presented in ASTM E 136-11.

ASTM E 136 TEST DATA SHEET

Client:	The Aluminum Association, Inc.	*Receipt Date:*	February 28, 2011
Operator:	Z. Holt	*Date Prepared by SwRI:*	Prepared on test date
Test Date(s):	March 22 and 25, 2011	*Color:*	Silver
Material ID:*	873	*Original Thickness:*	6.4 mm nominally
Trade Name:*	5083 - H116	*Test Sample Thickness:*	50 mm nominally
Description:*	5083 - H116 aluminum plate	*Average Sample Mass:*	190.94 g

** Information/instructions provided by the Client*

RESULTS

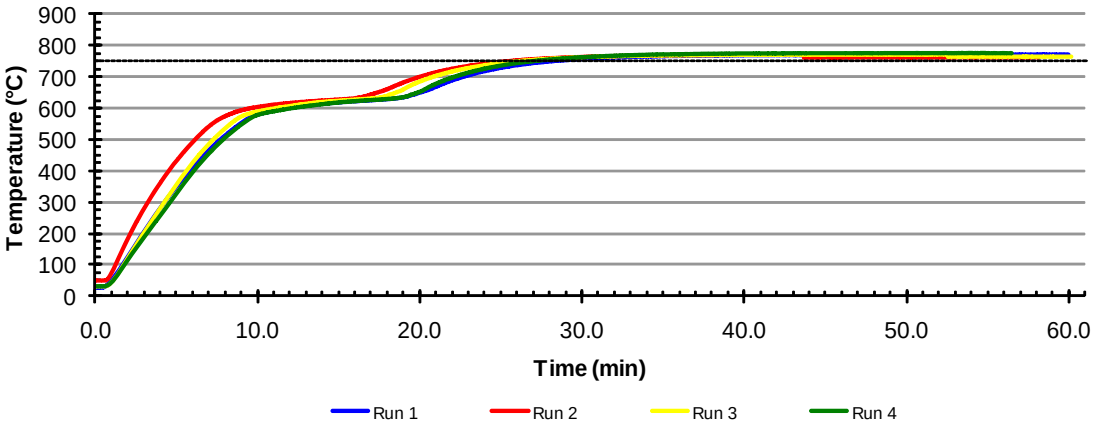
Run	Initial Mass (g)	Final Mass (g)	Percent Mass Loss	Specimen Center Stabilized (°C)	Maximum (°C)	ΔT (°C)	Criteria* ΔT< 30 °C	Specimen Surface Stabilized (°C)	Maximum (°C)	ΔT (°C)	Criteria* ΔT< 30 °C
1	194.34	193.86	0%	750	768	18	Pass	750	772	22	Pass
2	192.93	192.31	0%	751	770	19	Pass	751	772	21	Pass
3	187.76	187.48	0%	751	770	19	Pass	751	772	22	Pass
4	188.71	188.62	0%	752	776	23	Pass	752	774	22	Pass

*Criteria for when percent mass loss < 50%

TEST OBSERVATIONS

	Insertion Time (s)	Ignition Time (min:s)	Flameout (min:s)	Duration of flaming (min:s)	Criteria: No flaming after first 30 s	Observed Smoke (min:s)	Observed Soot (min:s)	Total Test Time (s)
1	19	N/A	N/A	0:00	Pass	None	None	3355
2	34	N/A	N/A	0:00	Pass	None	None	2584
3	33	N/A	N/A	0:00	Pass	None	None	3117
4	31	N/A	N/A	0:00	Pass	None	None	3351

Center Temperature Graph



Surface Temperature Graph